



# Desert Sky Observer

Volume 31

Antelope Valley Astronomy Club Newsletter

November 2011

## Up-Coming Events

**November 9:** Acton Library Astronomy Lecture and Star Party @ [Acton Library](#)

**November 11:** Club Meeting\*

**November 12:** Prime Desert Woodland Moon Walk @ [Prime Desert Woodlands](#)

**November 14:** Executive Board Meeting @ [Don's house](#)

**November 18:** Messier Club @ [Two Goats Observatory](#)

**November 26:** Dark Sky Star Party @ [Red Rock/Ricardo campground](#)

\* Monthly meetings are held at the S.A.G.E. Planetarium on the Cactus School campus in Palmdale, the second Friday of each month. The meeting location is at the northeast corner of Avenue R and 20<sup>th</sup> Street East. Meetings start at 7 p.m. and are open to the public. *Please note that food and drink are not allowed in the planetarium*



## President

### Don Bryden

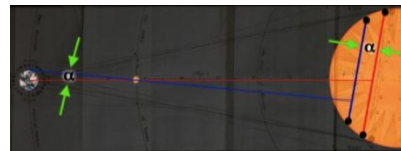
Raise your hand if you've had this happen: You're at a star party and someone comes up and asks, "So what's so special about tonight? What's happening?" You think, "Well it's a new moon and we've just come out to see the night sky – nothing special! Or is there?" You wonder, is there some celestial event of which I'm unaware?

Or even better, I'll get a call from someone who got my number from the website, "What's the club doing for the meteor shower tomorrow night?" First, I think, it's Tuesday – I expect most of us will be in bed since I have to work at six in the morning! Then I might think, "*What* meteor shower?!" Ohhh! That's right it's the Delphinids or the Ophiuchiids or some other such minor shower that no one would have heard of until YAHOO or GOOGLE came along. I mean, meteor showers are more of an extra bonus when I'm out at a dark site doing some *real* observing, aren't they?

Still, I explain that we're not planning an event because it's mid-week, the moon is full and the shower they're asking about is so insignificant that I'd see more fireballs on any average dark night up at Pinos. I couch it in nicer terms and make it seem that, damn if it was a better time of the month we'd all be out there with our lawn chairs and blankets.

Or how about this one: I'm letting someone take a peek through my scope at M13 and they "ooh and ahhh" then ask, "So what do you think about all that Mayan Calendar business?" or "I hear that the solar system is going to be in alignment with the center of the galaxy." Or "what about that asteroid (or comet or meteor or planet X) that's supposed to hit the Earth next year?" I try to assure them that there is no alignment, that the end of the thirteenth Baktun makes no difference, that there is no planet X or hopefully it'll be many long years before another large planet-killing comet comes along. They nod and say, "That's good." But deep down inside I feel that they're disappointed. They wanted some inside info on the end of the world or at least a preview of some cataclysmic celestial event.

There *are* a few events coming up next year not to be missed, though. First there's an annular solar eclipse that will be visible across all northern California on May 20<sup>th</sup>. Then one event we *will* be hosting: come view the last transit of the Sun by Venus for the next hundred and five years! Timings of first exterior and interior contact as well as charting the path across the sun from multiple locations allowed astronomers such as Edmund Halley to determine a very precise distance of the Earth to the Sun and therefore to gauge the size of our solar system. The transit will occur on the 5<sup>th</sup> of June in our location (and by the way this will also mark a grand solar system alignment of planets and no, this will *NOT* cause the end of the world!). The day before will also have a partial lunar eclipse at moonset - that's quite an alignment we have lined up! Finally, if you're heading down under, on November 13<sup>th</sup> will be the year's only total solar eclipse.



Well there you have it – mark those calendars and maybe we'll have a few good public outreach star parties. And maybe, just maybe, the next time someone asks about the end of the world I'm going to stare back stone faced and say, "so you've *heard* about Apophis, then! It passed right through the keyhole and is now with 99.99% certainty going to come back around in 2029 and smash into the Earth! I don't know about you but I plan on moving to Australia which has been judged to be the only safe haven from the impact!" Maybe I'll move before next year's solar eclipse – that is if Betelgeuse doesn't blow and take us out first!



## Vice President

### Rose Moore

On Wednesday 11/9 we have the Acton Library Astronomy Lecture with Jeremy at 6:30pm. Star gazing after the lecture, weather permitting. The lecture on this date is 'Living in a Vacuum, 4 Simultaneous Ways to Die in Space'!

For our meeting on Friday 11/11, we will have a Planetarium show with Jeremy, to be announced at the meeting. Please come out to visit with your fellow members and enjoy a great dome show! Also, for those that will need to pay by check or cash for the Christmas party (see below), please plan on attending to pay Virginia (Treasurer) that night.

Saturday, 11/12 at 5:30pm is our PDW Moonwalk with Jeremy! We need members with scopes, and/or other astronomy items of interest, to show the public for our last PDW for 2011. Dress warm!!

We have a possible star party for the Amargosa Creek Middle School the month of November....further info to come. This would be a weekday event.

Wednesday, 12/7 at 6:30pm, we have our last Acton Library Astronomy Lecture with Jeremy. Tonight: 'Astronomy and Ancient Cultures', followed by some star gazing, weather permitting.

And our last event of the year will be our Annual AVAC Club Christmas Party!! This event is for members only! We will be again at the Embassy Suites in Palmdale. The menu, as well as cost, payment, and directions will be up on the website shortly. Club emails with info will also be sent out, as well as those needing 'snail mail' letters. Payment will be due by Thanksgiving, as we will need to pay Embassy Suites on Nov. 26th, as well as giving them the menu information. There will be a silent auction and raffle.

Anyone having items they want to donate, please let one of the board members know. You may also bring any items directly to the Christmas Party! See you all there!

Many thanks to those who have come out to support our club outreach events in the last couple of months, esp. for PDW and the 'Glory of the Universe' Star party in Rosamond this past weekend! We cannot do these events without YOU! We are also lining up speakers for 2012, if you have any suggestions, please contact me!



## Secretary

### Frank Moore

Well friends, we had a wonderful day, and wonderful night, at the “Glory Of The Universe Event” put on by Lee Bush and his church near Rosamond. Many thanks to the members who showed up to support Lee in this annual event.

The skies remained clear throughout the event and it was neither too hot in the day, or too cold at night, to be uncomfortable. At 1:30 in the morning Don and I were still in short pants with my light sweatshirt the only concession to the cooling temperature.

We had a great turnout of club members and a wide selection of telescopes to share with the public. A big “thank you” to all of our members who helped out.

Don hauled five telescopes to the event. During the day he had the club's 60mm Coronado for solar viewing which, as always, was a big hit. This was supplemented by the Moore's C-11, with a white light filter, for viewing the ample display of sunspots.

Don also brought his 12” Truss Dobsonian aka “The Foot Scope”, Duane and his 10” Truss Dob “The Marv Scope”, the clubs 13.1” Truss Dob (so Rose could work on her Messier list), and his daughters 6” Orion Dob which was used by Ellen Mahler.

In addition to the scopes noted above, Frank and Rose had their Celestron C-11, Matt Leone had his 16” Dob “Mr. Water Heater”, Bob Ayres had his Celestron C-8, Bill and Pam Grove had their Orion Dob, Bill Schebeck had a Galileo Newtonian Reflector, and Lee Bush had his marvelous 12” Truss Dob “Jacobs Ladder” that I get to see and use far too infrequently (hint, hint).

The relatively dark skies allowed us to share a variety of deep sky objects with the attendees with Jupiter providing a good show of its bands and four moons. I broke out the red glow sticks and glow bracelets and found myself doing nothing but handing them out to the kids for at least half an hour. I didn't know there were so many kids at the event...maybe some came back twice. We had great time and got to share the wonders of the night sky with many folks who had never seen it “live” through a telescope.

BTW, you can expect to see pictures of our Club President, whom Lee Bush introduced as “Pastor Don Bryden” playing banjo with Lee's band while Lee played fiddle. In the middle of the night, Don was heard plinking out a tune, I think about the Messier Objects, that I expect will be “coming to a star party near you soon.” I can't wait to hear it.

Dark skies.

## Space Place

### The Gray Cubicle You Want to Work In

By Dr. Tony Phillips

It's another day at the office.

You're sitting in a gray cubicle, tap-tap-taping away on your keyboard, when suddenly your neighbor lets out a whoop of delight.

Over the top of the carpeted divider you see a star exploding on the computer screen. An unauthorized video game? No, this explosion is real. A massive star just went supernova in the Whirlpool Galaxy, and the first images from Hubble are popping up on your office-mate's screen.

It's another day at the office ... *at NASA*.

Just down the hall, another office-mate is analyzing global temperature trends. On the floor below, a team of engineers gathers to decode signals from a spaceship that entered "safe mode" when it was hit by a solar flare. And three floors above, a financial analyst snaps her pencil-tip as she tries to figure out how to afford *just one more* sensor for a new robotic spacecraft.

These are just a few of the things going on every day at NASA headquarters in Washington DC and more than a dozen other NASA centers scattered around the country. The variety of NASA research and, moreover, the variety of NASA people required to carry it out often comes as a surprise. Consider the following:

NASA's Science Mission Directorate (SMD) supports research in four main areas: Earth Science, Heliophysics, Astrophysics, and Planetary Science. Read that list one more time. It includes everything in the cosmos from the ground beneath our feet to the Sun in the sky to the most distant galaxies at the edge of the Universe. Walking among the cubicles in NASA's science offices, you are likely to meet people working on climate change, extraterrestrial life, Earth-threatening asteroids, black holes or a hundred other things guaranteed to give a curious-minded person goose bumps. Truly, no other government agency has a bigger job description.

And it's not just scientists doing the work. NASA needs engineers to design its observatories and build its spacecraft, mathematicians to analyze orbits and decipher signals, and financial wizards to manage the accounts and figure out how to pay for everything NASA dreamers want to do. Even writers and artists have a place in the NASA scheme of things. Someone has to explain it all to the general public.

Clearly, some cubicles are more interesting than others. For more information about the Science Mission Directorate, visit <http://science.nasa.gov> . And for another way to reach the Space Place, go to <http://science.nasa.gov/kids> .

## Mystery Sighting by Paul Derrick

Sonya Moyer of Boyertown, PA, recently emailed me asking about a mysterious night sky sight she couldn't identify.

She wrote: "This morning around 5 a.m., I saw an amazing sight. I was sitting on my back porch facing southeast looking at the stars. A little above Orion a star just "swelled up" and seemed to burst! There were a few faint "sparks" that traveled up and to the right, then nothing – nothing where the star had been a moment before. I am sure of what I saw. Can you comment on this? Or you can just call me crazy, and I won't be offended. Sincerely, Sonya Moyer."

My response: "No, I don't think you're crazy. I'm guessing you happened to see a meteor coming directly in your direction before it broke apart and burned up. Meteors "falling" and burning up in our atmosphere are a common occurrence, and meteors breaking up before burning up, although less common, aren't rare. But, given that I've heard of so few reports, I'd say your experience is rare. In fact, I'm aware of only one other person who has shared your experience – ME – although I'm sure others must have as well.

"I had the same experience once while stargazing alone at a state park in far west Texas, only mine didn't explode – it just increased in brightness rather dramatically, and then rather quickly faded away. I was baffled until a fellow stargazer later proffered an explanation, and I realized that must have been what I had seen. In both our cases, the meteor might have been "natural" (a piece of stony or metallic meteoroid material) or human-made (a piece of satellite or rocket debris reentering and burning up in Earth's atmosphere).

"Given that one must be viewing in the right direction at the right moment from the right location on Earth to see what we saw, I'd say we were pretty lucky – and you were even luckier as your meteor broke up before disintegrating. Of course, we might be lucky in yet another way – had the meteor not completely burned up, and it was heading directly toward us... Thanks for sharing your experience."

Most people have seen meteors, also called "shooting stars" and "falling stars," and stargazers who spend hours under the stars see countless meteors from the ordinary to those that make you gasp. And while seeing a meteor break up is far less common, it's not rare – I recall seeing three or four.

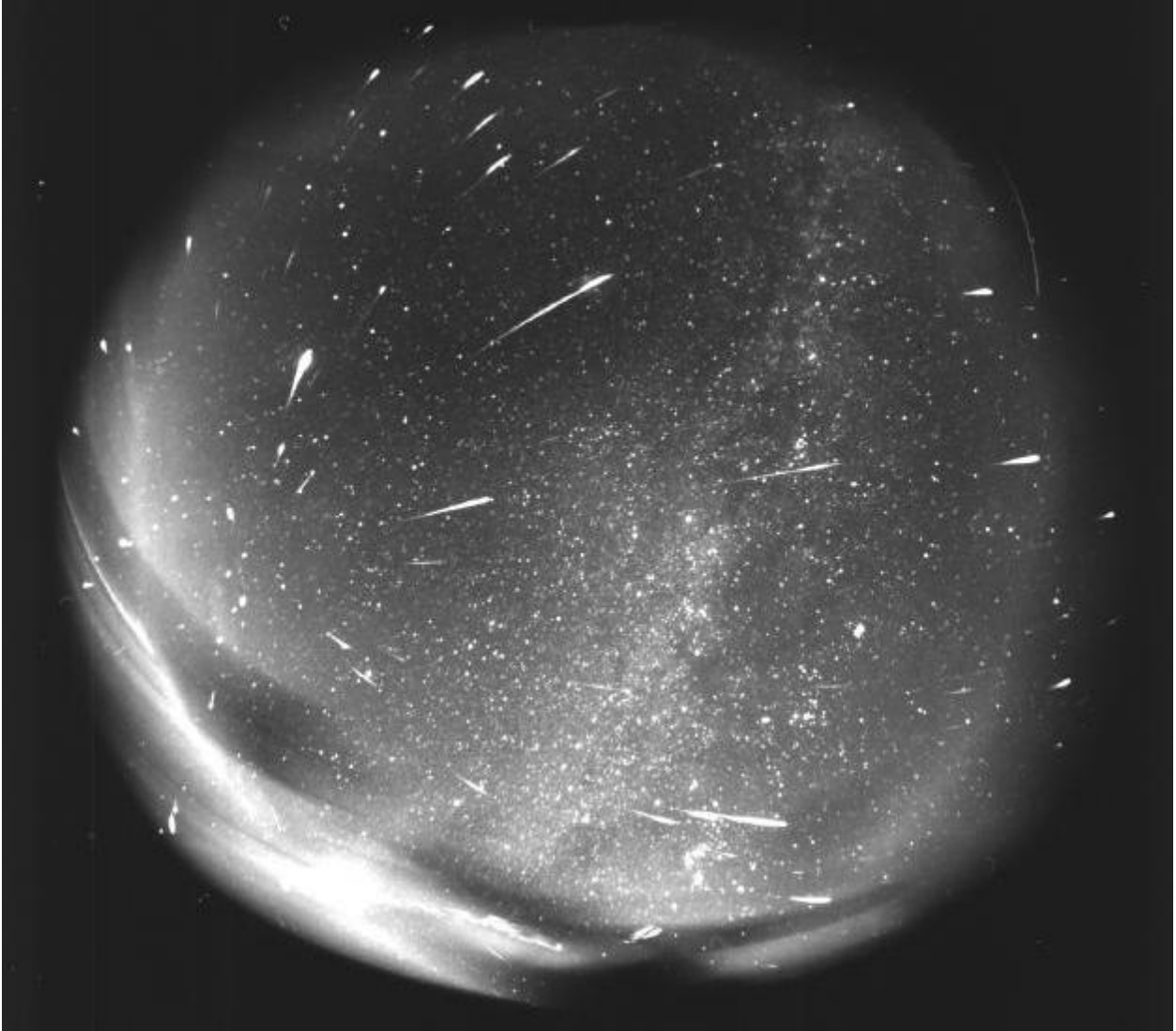
But seeing a meteor coming straight toward you – I would consider that pretty rare. And having a directly incoming meteor break up – extremely rare. I would like to hear from anyone who has seen either, or both simultaneously.

While meteors can usually be seen any clear night of the year and any time of night, seeing them still takes a bit of luck. One has to be looking in the right place at the right time, and they are usually so fleeting there's not time to point them out to a companion.

There are, however, ways of increasing the odds of seeing meteors. More will be seen under dark skies, away from urban light pollution, and when the Moon isn't up to wash out all but the brightest. And comfort is important. You'll probably want to stretch out on a blanket or reclining lawn chair as standing or sitting in an ordinary lawn chair can be tiring and will quickly make your back and neck ache. When that happens, you'll not want to watch long, reducing your chances of seeing meteors. When looking, slowly pan the skies in the direction with the least light pollution which is usually directly overhead. And while it's not convenient for us night owls, more meteors are visible in the morning than evening with the best hours being from midnight to dawn.

Finally, more meteors are apt to be seen during annual meteor showers, two of which occur this month. As Earth speeds around the Sun at 67,000 mph, it regularly passes through the debris-strewn paths of

several comets. When some of the debris enters Earth's atmosphere, friction causes it to burn and momentarily glow brilliantly as meteors in our night sky.



*Image: All-sky fish-eye 4-hour exposure of the Leonid meteor shower November 17, 1998.*

*Most of the 156 meteors captured in this image seem to radiate from the constellation Leo the Lion, hence the name.*

*Credit: Juraj Toth at Modra Observatory in Slovakia, posted on Wikimedia Commons.*

The following are the major annual meteor showers and when they usually peak. Dates are approximate since cometary debris drifts somewhat in space, making it difficult to predict the exact timing of Earth's passage through the maximum debris stream. Thus, it's best to be alert for increased meteor activity for several days around each stated date. Quadrantid – Jan. 4 / Lyrids – Apr. 22 / Eta Aquarids – May 6 / Delta Aquarids – Jul. 30 / Perseids – Aug. 13 / Draconids – Oct. 8 / Orionids – Oct. 21 / Taurids – Nov. 12 / Leonids – Nov. 17 / Geminids – Dec. 14 / Ursids – Dec. 14

So in summary, one is more likely to see meteors away from urban lights under dark, moonless skies, after midnight, and during meteor showers. And who knows, like Sonya, you just might see one breaking up while coming directly toward you.

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## News Headlines

### **ALMA Opens Her Eyes — With Stunning Results**

There's a new telescope in town that just opened up for business. It's the long awaited ALMA, the Atacama Large Millimeter/submillimeter Array. Although it is still under construction, the science teams have released the first "early science" image, showing a pair of interacting galaxies called the Antenna Galaxies. ALMA's view reveals a part of the Universe that just can't be seen by visible-light and infrared telescopes.

<http://www.universetoday.com/89417/alma-opens-her-eyes-with-stunning-results/>

### **First Results from Dawn**

During August, NASA's Dawn spacecraft orbited the giant asteroid 4 Vesta at a separation of 1,700 miles (2,750 km) and sent home exciting images and other observations of this alien world. This Monday, Dawn's team of scientists revealed the mission's first results at a joint meeting of the European Planetary Science Congress and the American Astronomical Society's Division of Planetary Sciences in Nantes, France.

<http://www.skyandtelescope.com/community/skyblog/newsblog/131153228.html>

### **Herschel detects abundant water in planet-forming disc**

ESA's Herschel space observatory has found evidence of water vapour emanating from ice on dust grains in the disc around a young star, revealing a hidden ice reservoir the size of thousands of oceans.

[http://www.esa.int/esaCP/SEMXSWFURTG\\_index\\_0.html](http://www.esa.int/esaCP/SEMXSWFURTG_index_0.html)

### **Wet and Mild: Caltech Researchers Take the Temperature of Mars's Past**

Researchers at the California Institute of Technology (Caltech) have directly determined the surface temperature of early Mars for the first time, providing evidence that's consistent with a warmer and wetter Martian past.

[http://media.caltech.edu/press\\_releases/13462](http://media.caltech.edu/press_releases/13462)

### **Dark Matter Mystery Deepens**

Like all galaxies, our Milky Way is home to a strange substance called dark matter. Dark matter is invisible, betraying its presence only through its gravitational pull. Without dark matter holding them together, our galaxy's speedy stars would fly off in all directions. The nature of dark matter is a mystery -- a mystery that a new study has only deepened.

<http://www.cfa.harvard.edu/news/2011/pr201129.html>

### **Did Earth's oceans come from comets?**

ESA's Herschel infrared space observatory has found water in a comet with almost exactly the same composition as Earth's oceans. The discovery revives the idea that our planet's seas could once have been giant icebergs floating through space.

[http://www.esa.int/esaCP/SEMER89U7TG\\_index\\_0.html](http://www.esa.int/esaCP/SEMER89U7TG_index_0.html)

### **Distant Galaxies Reveal the Clearing of the Cosmic Fog**

An international team of astronomers used the VLT as a time machine, to look back into the early Universe and observe several of the most distant galaxies ever detected. They have been able to measure their distances accurately and find that we are seeing them as they were between 780 million and a billion years after the Big Bang

<http://www.spaceref.com/news/viewpr.html?pid=34926>

## The 12 Commandments of Amateur Astronomers by Anonymous

( modified a bit by Tom Koonce)

1. Thou shalt have no white light before thee, behind thee, or to the side of thee whilst sharing the night sky with thy fellow stargazers.
2. Thou shalt not love thy telescope more than thy spouse or thy children; as much as, maybe, but not more.
3. Thou shalt not covet thy neighbor's telescope, unless it exceeds in aperture or electronics twice that of thy wildest dreams.
4. Thou shalt not read "Astronomy" or "Sky & Telescope" on company time, for thine employer makes it possible to continue thine astronomical hobby.
5. Thou shalt have at least two telescopes so as to keep thy spouse interested when the same accompanies thee under the night sky or on eclipse expeditions to strange lands where exotic wild animals doth roam freely.
6. Thou shalt not allow either thy sons or thy daughters to get married during the Holy Days of RTMC and PATS.
7. Thou shalt not reveal to thy spouse the true cost of thy telescope collection; only the individual components and that shall be done with great infrequency.
8. Thou shalt not buy thy spouse any lenses, filters, dew shields, maps, charts, or any other necessities for Christmas, anniversaries, or birthdays unless thy spouse needs them for their own telescope.
9. Thou shalt not deceive thy spouse into thinking that ye are taking them for a romantic Saturday night drive when indeed thou art heading for a dark sky site.
10. Thou shalt not store thy telescope in thy living room, dining room, or bedroom, lest thou be sleeping alone with it full time.

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11. Verily, observe not through thy neighbor's Astro-Physics or Takahashi, lest thee be utterly consumed by the lust of apo-fever, and thy brain and thy bank account shall shrivel and wither like branches in a flame...

12. Verily, observe not through thy neighbor's Dob of Goliath, lest thee be lain bare to the fires of aperture-fever, and thy sanity, thy sacroiliac and thy life savings be crushed as ye grapes of wrath...

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## November Sky Data

**Best time for deep sky observing this month:  
November 19 through November 30**

**Mercury** is at its greatest distance east of the Sun in the middle of November, but it sets less than an hour after sunset. We're unlikely to see this elusive little planet this month.

**Venus** is slowly reappearing as the "Evening Star". By the end of November it is setting in the south-west just after 5 pm. Although Venus shines intensely bright, it will still be quite hard to see this month, unless you have a very clear south-western horizon.

**Mars** is rising in the east shortly before midnight, and it's well up in the southern sky at dawn. In the telescope, Mars shows a disc less than 7 arc-seconds across; there is little chance of seeing any detail yet. But Mars is gradually increasing in apparent size and brightness, as we draw closer to it.

**Jupiter** was in opposition (to the Sun) at the end of October, so this month it is still very well placed for viewing. It's well up in the east at dusk, it shines all night, and doesn't set in the west until near dawn. Relative to the stars, Jupiter is moving slowly south-westwards in Aries, close to the border with Pisces.

**Saturn** is rising in the east just before sunrise, far to the lower left of Mars; it gets easier to see as the month goes by. Relative to the stars, Saturn is moving slowly south-eastwards, crossing the constellation of Virgo from right to left, and passing above Spica, the brightest star in Virgo.

The Leonid **meteor shower** is generally active between November 15th and 20th; this year it will probably peak early on Friday November 18th. Shower meteors all seem to spread out from a single radiant point; for the Leonids, this point is within the "Sickle" of Leo. It rises in the east before midnight, but we won't see many Leonid meteors until after midnight.

First Qtr Nov 2      Full Nov 10      Last Qtr Nov 18      New Nov 24



## Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
11/1/2011	12:58	23:47	07:12	17:58
11/5/2011	15:05	02:39	07:16	17:54
11/10/2011	16:44	06:15	06:20	16:50
11/15/2011	21:01	10:26	06:25	16:46
11/20/2011	01:15	13:25	06:30	16:44
11/25/2011	07:06	17:18	06:34	16:42
11/30/2011	11:06	22:33	06:39	16:40

## Planet Data

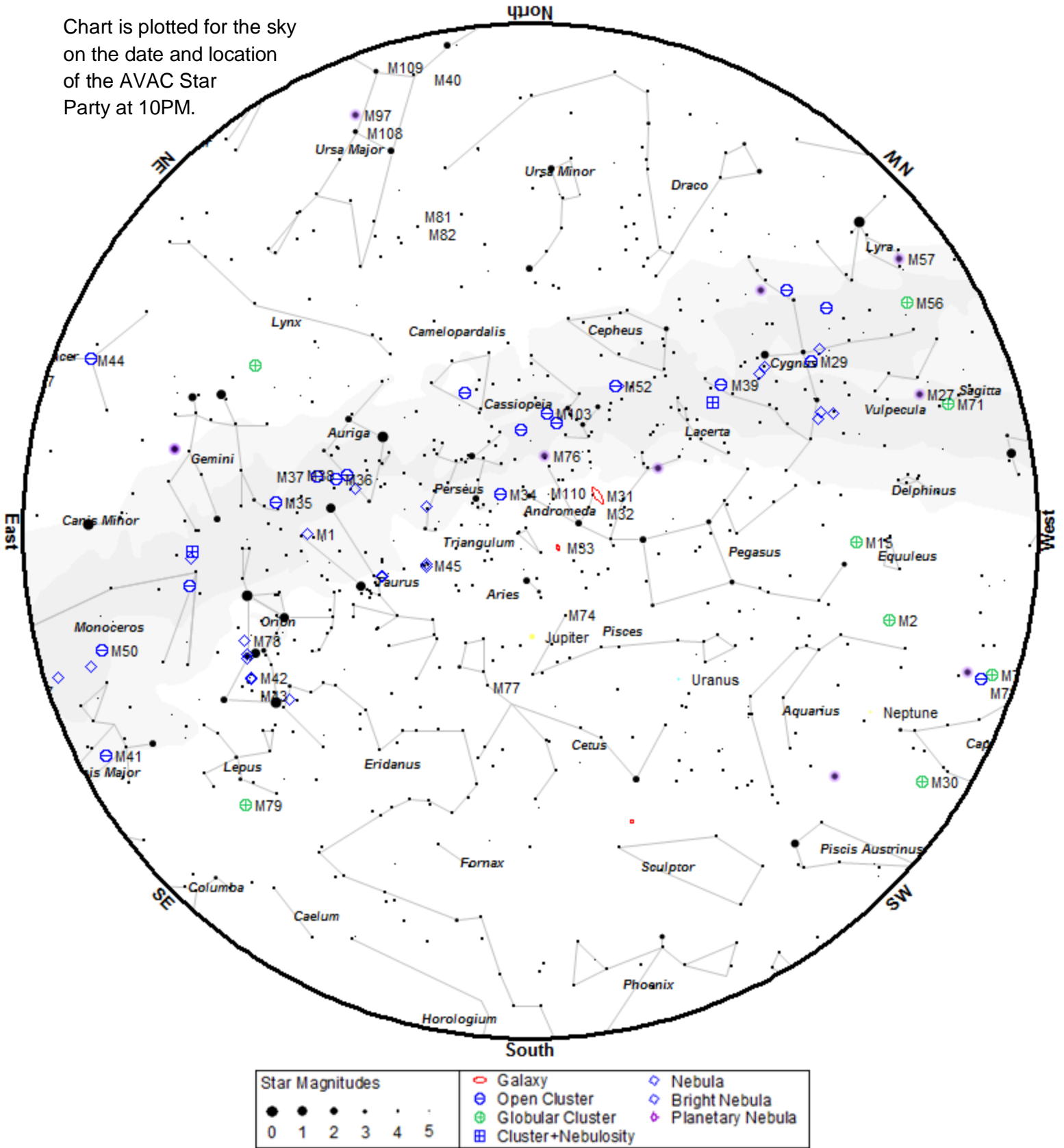
	Nov 1			
	Rise	Transit	Set	Mag
<b>Mercury</b>	08:51	13:53	18:57	-0.3
<b>Venus</b>	08:48	13:57	19:07	-3.9
<b>Mars</b>	01:10	07:59	14:50	1.1
<b>Jupiter</b>	17:38	00:18	06:58	-2.9
<b>Saturn</b>	05:43	11:32	17:24	0.7

	Nov 15			
	Rise	Transit	Set	Mag
<b>Mercury</b>	08:16	13:10	18:03	-0.2
<b>Venus</b>	08:18	13:15	18:15	-3.9
<b>Mars</b>	23:49	06:32	13:16	0.9
<b>Jupiter</b>	15:38	22:16	04:55	-2.9
<b>Saturn</b>	03:55	09:43	15:34	0.7

	Nov 30			
	Rise	Transit	Set	Mag
<b>Mercury</b>	07:04	12:15	17:16	2.9
<b>Venus</b>	08:43	13:38	18:34	-3.9
<b>Mars</b>	23:23	05:59	12:37	0.7
<b>Jupiter</b>	14:35	21:12	03:48	-2.8
<b>Saturn</b>	03:04	08:50	14:39	0.7

Planet, Sun, and Moon data calculated for local time at Lancaster, CA

Chart is plotted for the sky on the date and location of the AVAC Star Party at 10PM.



To use the chart, go outside within an hour or so of the time listed and hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge.

## Suggested Observing List

The list below contains objects that will be visible on the night of the AVAC Star Party. The list is sorted by the best time to observe the object. The difficulty column describes how difficult it is to observe the object from the current location on a perfect night in a 6 inch Newtonian telescope.

ID	Cls	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
M 92	Glob	6.5	Her	17h17m07.0s	+43°08'12"	17:51	18:07	19:00	easy
NGC 6543	PNe	8.3	Dra	17h58m33.4s	+66°37'59"	17:40	18:09	19:42	obvious
M 57	PNe	9.4	Lyr	18h53m35.1s	+33°01'45"	17:47	18:09	19:19	easy
M 56	Glob	8.4	Lyr	19h16m36.0s	+30°11'06"	17:54	18:10	19:17	detectable
NGC 7009	PNe	8.3	Aqr	21h04m10.9s	-11°21'48"	17:41	18:10	19:17	obvious
M 71	Glob	8.4	Sge	19h53m46.0s	+18°46'42"	17:49	18:11	19:48	easy
M 27	PNe	7.3	Vul	19h59m36.3s	+22°43'16"	17:50	18:11	20:01	easy
NGC 6871	Open	5.8	Cyg	20h05m59.0s	+35°46'36"	17:49	18:12	20:28	easy
M 30	Glob	6.9	Cap	21h40m22.0s	-23°10'42"	17:50	18:12	18:20	detectable
NGC 6910	Open	7.3	Cyg	20h23m12.0s	+40°46'42"	17:48	18:13	20:57	easy
M 29	Open	7.5	Cyg	20h23m57.0s	+38°30'30"	17:48	18:13	20:48	easy
NGC 7160	Open	6.4	Cep	21h53m40.0s	+62°36'12"	17:44	18:20	23:23	obvious
NGC 7243	Open	6.7	Lac	22h15m08.0s	+49°53'54"	17:49	18:20	22:01	detectable
M 39	Open	5.3	Cyg	21h31m48.0s	+48°26'00"	17:47	18:20	22:16	easy
M 15	Glob	6.3	Peg	21h29m58.0s	+12°10'00"	17:49	18:20	20:47	easy
M 2	Glob	6.6	Aqr	21h33m27.0s	-00°49'24"	17:51	18:20	20:25	detectable
NGC 7293	PNe	6.3	Aqr	22h29m38.5s	-20°50'14"	17:49	18:20	19:38	detectable
M 52	Open	8.2	Cas	23h24m48.0s	+61°35'36"	17:53	18:54	23:06	detectable
NGC 7789	Open	7.5	Cas	23h57m24.0s	+56°42'30"	17:54	19:27	23:18	detectable
NGC 7790	Open	7.2	Cas	23h58m24.0s	+61°12'30"	17:45	19:28	01:25	obvious
NGC 55	Gal	8.5	Scl	00h15m08.4s	-39°13'13"	18:37	19:44	20:51	difficult
M 110	Gal	8.9	And	00h40m22.3s	+41°41'09"	17:52	20:10	00:00	detectable
M 31	Gal	4.3	And	00h42m44.3s	+41°16'07"	17:49	20:12	00:51	easy
M 32	Gal	8.9	And	00h42m41.8s	+40°51'58"	17:49	20:12	00:49	easy
NGC 253	Gal	7.9	Scl	00h47m33.1s	-25°17'20"	19:51	20:17	20:42	detectable
NGC 288	Glob	8.1	Scl	00h52m45.0s	-26°35'00"	18:51	20:22	21:53	difficult
NGC 457	Open	5.1	Cas	01h19m35.0s	+58°17'12"	17:46	20:49	02:39	obvious
NGC 559	Open	7.4	Cas	01h29m31.0s	+63°18'24"	17:47	20:59	03:02	easy
M 103	Open	6.9	Cas	01h33m23.0s	+60°39'00"	17:44	21:02	02:58	obvious
M 33	Gal	6.4	Tri	01h33m50.9s	+30°39'36"	17:54	21:03	00:56	detectable
M 76	PNe	10.1	Per	01h42m19.9s	+51°34'31"	17:55	21:11	01:25	detectable
NGC 637	Open	7.3	Cas	01h43m04.0s	+64°02'24"	17:43	21:12	03:17	obvious
NGC 663	Open	6.4	Cas	01h46m09.0s	+61°14'06"	17:48	21:16	03:11	easy
NGC 752	Open	6.6	And	01h57m41.0s	+37°47'06"	18:58	21:27	23:56	challenging
NGC 869	Open	4.3	Per	02h19m00.0s	+57°07'42"	17:45	21:48	03:34	obvious
NGC 884	Open	4.4	Per	02h22m18.0s	+57°08'12"	17:47	21:51	03:37	obvious
NGC 957	Open	7.2	Per	02h33m21.0s	+57°33'36"	17:52	22:02	03:33	easy
Heart Neb.	Neb	6.5	Cas	02h33m52.0s	+61°26'50"	19:31	22:03	00:36	challenging

ID	Cls	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
M 34	Open	5.8	Per	02h42m05.0s	+42°45'42"	17:59	22:11	02:38	easy
M 77	Gal	9.7	Cet	02h42m40.8s	-00°00'48"	19:03	22:12	01:20	detectable
NGC 1027	Open	7.4	Cas	02h42m40.0s	+61°35'42"	18:00	22:12	02:45	detectable
NGC 1245	Open	7.7	Per	03h14m42.0s	+47°14'12"	20:21	22:44	01:06	challenging
NGC 1342	Open	7.2	Per	03h31m38.0s	+37°22'36"	18:43	23:00	03:18	easy
M 45	Open	1.5	Tau	03h47m00.0s	+24°07'00"	18:39	23:16	03:52	obvious
NGC 1444	Open	6.4	Per	03h49m25.0s	+52°39'30"	17:49	23:18	04:55	obvious
NGC 1502	Open	4.1	Cam	04h07m50.0s	+62°19'54"	17:45	23:37	05:32	obvious
NGC 1528	Open	6.4	Per	04h15m23.0s	+51°12'54"	18:33	23:45	04:57	easy
Hyades	Open	0.8	Tau	04h26m54.0s	+15°52'00"	19:39	23:55	04:11	easy
NGC 1647	Open	6.2	Tau	04h45m55.0s	+19°06'54"	20:50	00:15	03:40	detectable
NGC 1664	Open	7.2	Aur	04h51m06.0s	+43°40'30"	19:21	00:20	05:15	easy
NGC 1746	Open	6.1	Tau	05h03m50.0s	+23°46'12"	21:00	00:33	04:05	detectable
NGC 1851	Glob	7.1	Col	05h14m06.0s	-40°02'48"	23:26	00:42	01:58	detectable
M 38	Open	6.8	Aur	05h28m40.0s	+35°50'54"	20:46	00:58	05:08	detectable
M 1	Neb	8.4	Tau	05h34m30.0s	+22°01'00"	23:00	01:03	03:05	challenging
M 43	Neb	9.0	Ori	05h35m30.0s	-05°16'00"	21:53	01:03	04:14	challenging
M 42	Neb	4.0	Ori	05h35m18.0s	-05°23'00"	21:53	01:03	04:14	easy
M 36	Open	6.5	Aur	05h36m18.0s	+34°08'24"	20:09	01:05	05:26	easy
M 78	Neb	8.0	Ori	05h46m48.0s	+00°05'00"	21:44	01:15	04:46	challenging
M 37	Open	6.2	Aur	05h52m18.0s	+32°33'12"	20:36	01:20	05:25	easy
NGC 2129	Open	7.0	Gem	06h01m07.0s	+23°19'20"	20:56	01:29	05:30	obvious
NGC 2169	Open	7.0	Ori	06h08m24.0s	+13°57'54"	21:26	01:37	05:28	obvious
M 35	Open	5.6	Gem	06h09m00.0s	+24°21'00"	21:18	01:37	05:25	easy
NGC 2175	Open	6.8	Ori	06h09m39.0s	+20°29'12"	21:58	01:38	05:14	detectable
NGC 2237	Neb	5.5	Mon	06h32m02.0s	+04°59'10"	00:18	02:00	03:43	challenging
NGC 2264	Open	4.1	Mon	06h40m58.0s	+09°53'42"	22:08	02:09	05:27	obvious
M 41	Open	5.0	CMa	06h46m01.0s	-20°45'24"	00:36	02:14	03:52	easy
NGC 2301	Open	6.3	Mon	06h51m45.0s	+00°27'36"	22:48	02:20	05:25	easy
M 50	Open	7.2	Mon	07h02m42.0s	-08°23'00"	23:33	02:31	05:18	detectable
NGC 2353	Open	5.2	Mon	07h14m30.0s	-10°16'00"	23:55	02:43	05:29	easy
NGC 2355	Open	9.7	Gem	07h16m59.0s	+13°45'00"	23:59	02:45	05:16	difficult
NGC 2360	Open	9.1	CMa	07h17m43.0s	-15°38'30"	01:15	02:46	04:17	challenging
NGC 2392	PNe	8.6	Gem	07h29m10.8s	+20°54'42"	22:28	02:57	05:36	obvious
NGC 2393	Gal	14.6	Gem	07h30m04.6s	+34°01'40"	22:03	02:58	05:33	not visible
M 47	Open	4.3	Pup	07h36m35.0s	-14°29'00"	00:39	03:04	05:30	obvious
NGC 2423	Open	7.0	Pup	07h37m06.0s	-13°52'18"	00:36	03:05	05:25	easy
NGC 2439	Open	7.1	Pup	07h40m45.0s	-31°41'36"	00:54	03:08	05:17	easy
M 46	Open	6.6	Pup	07h41m46.0s	-14°48'36"	00:46	03:09	05:24	detectable
NGC 2440	PNe	11.5	Pup	07h41m55.4s	-18°12'31"	01:09	03:10	05:11	detectable
M 93	Open	6.5	Pup	07h44m30.0s	-23°51'24"	02:13	03:12	04:11	easy
NGC 2451	Open	3.7	Pup	07h45m23.0s	-37°57'21"	01:18	03:14	05:07	easy
NGC 2477	Open	5.7	Pup	07h52m10.0s	-38°31'48"	01:27	03:20	05:12	easy
NGC 2506	Open	8.9	Mon	08h00m01.0s	-10°46'12"	01:27	03:28	05:16	difficult
NGC 2547	Open	5.0	Vel	08h10m09.0s	-49°12'54"	02:55	03:38	04:20	detectable

ID	Cls	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
NGC 2546	Open	5.2	Pup	08h12m15.0s	-37°35'42"	02:31	03:40	04:50	difficult
NGC 2571	Open	7.4	Pup	08h18m56.0s	-29°45'00"	01:27	03:47	05:27	easy
M 44	Open	3.9	Cnc	08h40m24.0s	+19°40'00"	00:02	04:08	05:30	easy
IC 2391	Open	2.6	Vel	08h40m32.0s	-53°02'00"	03:45	04:08	04:33	detectable
IC 2395	Open	4.6	Vel	08h42m30.0s	-48°06'48"	03:05	04:10	05:13	easy
M 67	Open	7.4	Cnc	08h51m18.0s	+11°48'00"	01:24	04:19	05:25	detectable
M 82	Gal	9.0	UMa	09h55m52.4s	+69°40'47"	23:14	04:55	05:29	easy
M 81	Gal	7.8	UMa	09h55m33.1s	+69°03'56"	23:31	04:55	05:29	detectable
NGC 3227	Gal	11.5	Leo	10h23m30.6s	+19°51'54"	02:44	05:02	05:25	difficult
M 97	PNe	11.0	UMa	11h14m47.7s	+55°01'09"	03:37	05:02	05:22	challenging
NGC 3242	PNe	8.6	Hya	10h24m46.1s	-18°38'32"	03:56	05:05	05:34	obvious
M 66	Gal	9.7	Leo	11h20m14.9s	+12°59'30"	03:06	05:05	05:27	detectable
M 65	Gal	10.1	Leo	11h18m55.7s	+13°05'32"	03:08	05:06	05:27	detectable
M 106	Gal	9.1	CVn	12h18m57.6s	+47°18'13"	03:07	05:06	05:26	detectable
M 94	Gal	8.7	CVn	12h50m53.1s	+41°07'12"	03:11	05:07	05:28	easy
Col 256	Open	2.9	Com	12h25m06.0s	+26°06'00"	03:13	05:07	05:28	easy
NGC 4565	Gal	10.1	Com	12h36m20.8s	+25°59'15"	04:04	05:07	05:24	difficult
M 86	Gal	9.8	Vir	12h26m12.2s	+12°56'44"	04:04	05:07	05:24	detectable
M 84	Gal	10.1	Vir	12h25m03.9s	+12°53'12"	03:54	05:07	05:24	detectable
M 51	Gal	8.7	CVn	13h29m52.3s	+47°11'40"	03:33	05:08	05:29	easy
M 87	Gal	9.6	Vir	12h30m49.2s	+12°23'29"	03:55	05:07	05:25	detectable
M 64	Gal	9.3	Com	12h56m43.8s	+21°41'00"	03:54	05:08	05:25	detectable
M 49	Gal	9.3	Vir	12h29m46.8s	+08°00'01"	04:01	05:08	05:25	detectable
M 101	Gal	8.4	UMa	14h03m12.4s	+54°20'53"	04:00	05:08	05:24	detectable
NGC 5195	Gal	10.5	CVn	13h29m59.6s	+47°15'58"	03:50	05:08	05:26	detectable
NGC 3132	PNe	8.2	Vel	10h07m01.8s	-40°26'11"	03:39	05:08	05:33	easy
NGC 3132	PNe	8.2	Vel	10h07m01.8s	-40°26'11"	03:39	05:08	05:33	easy
M 3	Glob	6.3	CVn	13h42m11.0s	+28°22'42"	04:25	05:09	05:27	easy
NGC 3201	Glob	6.9	Vel	10h17m37.0s	-46°24'42"	04:17	05:14	05:34	challenging
NGC 3228	Open	6.4	Vel	10h21m22.0s	-51°43'42"	04:55	05:21	05:33	easy

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